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kettles, beads, &c. There were 3 lodges; 2 old men, 1 middle-aged one, and 3 young ones, 3 women, and 6 children. We had seen two of the young men previously at M'Kinlay River, on our way down. We left them after a very friendly interview and giving them handsome presents. There is every appearance of a river falling into a deep bay on the east side of Lake Pelly. The Canada geese migrating to the southward: 25 deer seen going in the same direction.

Tuesday, 21*st*.—It was miserably cold, blowing fresh and raining when we embarked at 3 A.M. Hoisted sail at Bullen River, and carried it almost half the day. We were much troubled by sand-banks. Picked up our canoe in good order. Saw three lodges of Esquimaux at M'Kinlay River; 10 men, 8 women, and several children were present. The women were all of low stature, with pleasing features. The women are not tattooed till they have had children. Saw several kettles formed of five slabs of sandstone or slate, and cemented with earth or clay at the angles. Saw several of the Company's articles of trade among them. These Esquimaux seem to be a clean, harmless race. They made us understand that they came down M'Kinlay River, though at present it is nearly dry. Made them all handsome presents. The wind headed us in the evening, and it rained incessantly throughout the day. Encamped about a mile below M'Kinlay River. We have found nearly enough of willows for cooking since reaching Lake Garry.

Wednesday, 22*nd*.—The only good deer passes we have seen are at the rapids between Lakes Pelly and Garry, and at the Hawk Rapids, though doubtless there are others.

XVI.—1. *Account of a recent Visit to the Ancient Tanks of Ceylon, and of an attempt to trace the Course of the Ellahara Canal, &c.* By SIR HENRY GEORGE WARD, G.C.M.G., &c., Governor of Ceylon.

Communicated by the COLONIAL OFFICE.

Read June 22, 1857.

I HAVE already laid before the Executive Council the results of my observations upon the state of the northern province, and upon the Badulla roads. It remains for me to put into a similar shape the views suggested by my visit to Trincomalie, which occupied me from the 11th February to 3rd March, when I entered the district of Newera Kalawiya. These views will, I hope, be found not undeserving of attention, from their connexion with what I may term the "Tank Question." I mean the question as to the practicability and prudence of attempting to restore the system of artificial irrigation, which, under different circumstances, and in other times, unquestionably gave food and employment to a vast population in parts of the island which are now a desert.

This subject was brought before me at a very early period after my arrival here, by a Report upon the ancient canal of Ellehara, prepared by Messrs. Churchill, Adams, and Bailey. I have much pleasure in laying before the Executive Council this document, because it does credit to the enterprise, perseverance, and public spirit of the gentlemen who prepared it, and who voluntarily undertook a very laborious duty. It will be found to merit an attentive perusal, for it shows the immense amount of time, science, and combined exertion, that must have been brought to bear upon works of irrigation, at a period when agriculture in Europe was in the rudest and most primitive state. It proves, too, how vain human efforts are to stay the operation of those mightier causes which, though now lost in obscurity, have influenced the march of civilization, and which, so far as we can judge, by altering the course of navigation and trade, must have deprived Ceylon of those local advantages which made her in earlier ages the commercial depôt of the surrounding countries, and thus both created the necessity for those extraordinary works of which we admire the remains, and furnished her with the means of executing them.

For the purpose of these works, in every instance, seems to have been to provide *food* for a superabundant population. They may have been used, as the Ellehara Canal was, for traffic also. But irrigation was the primary object; and in the neighbourhood of most of the tanks, though the ground is now covered with forest trees, the growth of many centuries, it is easy to trace for miles around the ridges which denote the extent of paddy cultivation that once occupied the space now hid by interminable jungle.

This is not, however, the place or the time to inquire into the causes that led to these revolutions. All that we know positively, or can collect from ancient records, is, that there must once have been a large population congregated upon the western side of the island, in the neighbourhood of Manaar and Aripo; that the causes which prompted the selection of this barren and desolate coast as a commercial emporium probably determined the choice of Anaradhapoora as the seat of government; and this again led to the construction of the Giants' Tank and Padiwel Colum, the most wonderful work that I have yet visited, whether we look to size, difficulties of execution, or to the time at which these were surmounted, the 62nd year of the Christian era; that other causes equally obscure to us forced back this teeming population, leaving everywhere traces of its industry and skill, to the neighbourhood of Pollinarua, where its second capital was founded; that this second capital, like the first, is now a wilderness, and that nothing remains but the long line of tanks, which unite it with Tamblegam Bay and Trincomalie, to bespeak its ancient magnificence.

My object in visiting this scene of past splendour was a practical one. I wished to ascertain the state of the principal tanks, and to form an opinion as to the possibility of turning them to account, in connexion with modern improvements. I was accompanied on my tour by the government agents for the central and eastern provinces, as well as by Captain Sim, R.E., and Mr. Adams, one of the gentlemen who explored the Ellehara Canal, and who took the direction of the party from the time that we left the main road to Trincomalie, which we did 6 miles beyond Dambool, at the Tappal station of Innamalluwe, until we rejoined it again at Kandelly.

Our first day's march from Dambool was to Sigiri, a place too well known to require description.

It is the first and smallest of the line of tanks that fills the space parallel with the road from Innamalluwe to Kandelly. Indeed, as a tank, it hardly deserves to be classed with its neighbours, as it has no artificial supply of water, but simply receives, in a natural hollow, the drainage of the surrounding country, and more particularly of the rock upon which the old fortress of Sigiri stands. From Sigiri to Kondrowawe—the first of the artificial tanks formed by a regular "bund," or embankment of earth, faced with stone—the distance is about 8 miles. The whole intervening country is jungle, with the exception of a small amount of paddy cultivation in the vicinity of Kondrowawe.

The road is a path of the most rugged character, intersected by roots of trees and masses of rock ; and a similar path leads, for another 8 miles, from Kondrowawe to Angoulasse, a deserted village, once probably the centre of a large population, for, before reaching it, we crossed the "bund" of another tank, which, though now buried in jungle, must, from the size of the embankment, and of the stones, with which it is covered, have been of no ordinary dimensions. As we did not reach Angoulasse till dusk, the lateness of the hour prevented closer inquiry.

From Angoulasse to Topari, or Pollinarua, the distance is not above 8 miles, yet even in that space another beautiful tank occurs, which looked more like a natural lake than a piece of artificial water when viewed from the top of the "bund," along which we rode for 25 minutes, shaded by magnificent trees, the size of which bespeaks the antiquity of the embankment on which they stand. This tank is the tank of Dimitelli.

It occupies a plain, opening at one end upon the distant mountains of Matelle, from whence it draws its supplies of water, which are retained on one side by a natural slope, on the other side, and at the end next Topari, by artificial mounds of earth and stone. The embankments are perfect. The sluice, or spill-water, has been replaced by a temporary dam, which is not in good repair, and the leakage may ultimately injure the bund if not attended to. The object of the tank seems to have been the irrigation of the country between Dimitelli and Pollinarua, a space of about 4 miles, which is now a park studded with large trees, but bearing evident marks of ancient cultivation.

There would not, I presume, be any difficulty in restoring this whole district to its original state, if there were men to till the ground, or a market for the produce. The last might be found, in the course of a few years, in the growing demands of the Matelle coffee estates. But the other condition of renewed fertility seems to have disappeared altogether. From Dambool to Topari we did not see a village, and hardly a human creature.

Pollinarua, or Topari, the capital of Ceylon after the abandonment of Anaradhapoora, lies upon the borders of another tank, somewhat inferior in size and beauty to Dimitelli, but filling a large portion of the plain, around which the ancient town was situated. Ruins of temples, and dagobas, and other public edifices, mark its site, and show the great extent of ground which it covered. Many of these are still in a very perfect state. The paths that lead to them, cleared by the temple tenants, and trodden by frequent passengers, show that the place has not yet lost its *prestige*, and that the pilgrims to Dambool often include it in their devotional visits. Still there is an air of desolation in the scene which is very striking. A small village surrounded by magnificent trees, and separated from the lake by the bund, which forms its southern boundary, is now all that remains of human habitation in a place that must formerly have been the abode of many hundreds of thousands of our fellow creatures. Nor do I see what is to restore it.

There is, indeed, waste land in abundance. There is an unlimited supply of water.

But it is difficult to settle a *small* colony in so wild and isolated a position ; and I know not from whence the elements of a large colony are to be drawn, especially when there are other tanks, like Minnery and Kandelly, which combine the same natural advantages with the vicinity of a town and a port, from which, if the home market failed, their produce might be exported. As to *small* settlements, the fate of the villages that lingered on after the removal of the royal residence from Pollinarua, shows how difficult it is, without a certain amount of actual physical force, represented by numbers, to resist the influence of climate, sickness, and isolation. The cholera, or the small-pox, sweeps across a district, and the survivors have neither strength nor courage to continue their usual labours. The clearing of the water-courses is neglected, the dams broken down, the jungle allowed to encroach upon the fields that were once cultivated, the paths that separate the village from its neighbours are overgrown, and, in a very few years, the beasts of the field become the lords of the soil, and set the remnant of its human inhabitants at defiance. The tank districts are full of abandoned villages, of which this is the history; and the most lovely country that I have ever seen, rich in all the elements of successful industry, bids fair to become, before long, the domain of the elephant and the bear, without a single human competitor.

We left Pollinarua on the 17th February, and followed a jungle path for 6 miles, to Giritella Tank, a considerable sheet of water, which appears to be turned to little or no account. The tank was covered with every variety of birds, who were, evidently, seldom disturbed; and the bones of an elephant were whitening upon the grass close to the spot, where the track emerges from the forest. He was killed by the Vidahn of a neighbouring village, the lands of which had often suffered from his inroads.

The village itself is going rapidly to decay, and contains now only five or six families.

From Giritella to Minnery (4 miles) the path lies for 3 miles through thick jungle, and for the last mile through paddy-fields, watered by a stream which flows constantly from the tank, and would irrigate the whole 1000 amunams of land said once to have been under cultivation, but now reduced to 30.

In the evening we visited the lake—a much more appropriate name than tank for so large an expanse of water. It is near 21 miles in circumference, and of peculiar shape, forming bays, where it receives its principal feeders. The bund is, as usual, of enormous solidity.

There is no visible outlet at the point from which the stream that supplies the rice grounds issues. Yet it is perennial; and there can be no doubt that the run of the water is regulated by one of those ancient sluices placed under the bed of the lake, which seem to have answered so admirably the purposes for which they were constructed, though modern engineers cannot explain their action. The embankments are perfect. No symptoms of decay appear anywhere. The supply of water is most abundant, and nothing is wanted but population. From Minnery we went to Kowdella Tank, which is said to have equalled Minnery and Kandelly together in size, but is now in ruins, the waters having burst the bund at a period so distant, that what was once the bed of the tank is now a forest, abounding in trees of the largest dimensions.

The distance from Minnery was variously stated at from 12 miles to 18. I think it 14, having been 3¼ hours in doing it. The road through the jungle is good; but when it enters the bed of the tank and passes along the bund, once coated with the stones which are now scattered in irregular masses, or traverses the old rice-grounds which the lake formerly watered, the riding is difficult and even dangerous. The ground, too, had been poached by wild animals when wet, and their tracks were as hard as iron at the time of my visit. It is impossible to imagine anything wilder than the scenery. Herons and bitterns sat like statues on their accustomed perches as our cavalcade passed, so unaccustomed were they to see or fear man. The tank still retains water in many parts, and the magnificence of the vegetation denotes a soil said to be the best in Ceylon for the growth of rice and cotton, which last production, though indigenous, and of excellent quality, has hardly yet attracted the attention of capitalists.

The district appears to have acquired a character for insalubrity when the Trincomalie road was opened, and few have since ventured to establish themselves in it. The village of Polliancadowille, near which we encamped, is small and poor. The population decreases annually by sickness and emigration.

Kandelly, or Gantallawa, as it is more properly called, is the last of this long series of tanks, which, connected as most of them were by the Ellehara Canal, formed what was termed "the Sea of Prakrama."

From its vicinity to the Trincomalie road, Kandelly is better known than any of the other tanks which I have enumerated, and needs less description.

It is a noble sheet of water, at least 16 miles in circumference; formed, as is almost universally the case, by a large embankment, uniting two natural hills, and preventing the water, which flows into the plain, from finding a passage between them.

The distance from Kowdelly is 14 miles, a great part of which consists most unmistakeably of ground formerly used for rice cultivation. For 3 or 4 miles the path follows the old post-road to Kandy, and for the last 4 miles before re-entering the high road to Trincomalie, which we did at the 78th milestone from Kandy, we passed along a minor road, cut in a perfectly straight line, until it strikes the main road, 3 miles to the west of Kandelly Rest-house. We rode along the shores of the lake for the last 1½ miles before reaching this.

The embankment is perfect, without breach or flaw of any kind. It is 50 feet high, and 120 feet wide at its base, coated with stone, and overgrown with trees, the roots of which, striking deep into the artificial mound, impart to it additional solidity.

But for all details respecting this interesting tank, I am happy to be enabled to refer to a Report by Captain Sim, R.E. I shall have occasion to advert subsequently to the experiment for which Captain Sim is of opinion that Kandelly presents the most favourable site.

From what I have stated, it appears that, within a space of 60 miles, there are distributed no fewer than nine tanks, constructed with great labour considerable engineering skill, and of such solidity that their embankments seem to defy the hand of time; that, north of these again, about 40 miles, is, Padiwel Colum, the most gigantic work of all, for the bund, which is in perfect repair except at the one spot, where, in the course of ages, the waters have forced a passage between it and the natural hills, which it united, is 11 miles long, 30 feet broad at the summit, 180 feet the base, and 70 feet high; and that to the westward of Padiwel Colum, again, lie the Tank of Anarajapoora and the Giants' Tank, the dimensions of which I cannot give, as the work was never completed according to the original design.*

Padiwel Colum, great part of which I rode or walked over, was formed by the waters of the rivers Morra Oya and Moonganoo Oya, confined to the plain by the enormous bund which I have just described. Its construction must have occupied a million of people for 10 or 15 years.

It was completed by Maha Sen, A.D. 66, and the tank, when full, is said to have irrigated the whole space between the bund and the sea in the direction of Lake Kokolai.

A vast breach is now open, the depth of which is said to be unfathomable; and what was once the basin of the tank is covered with magnificent timber, except in those parts which are still under water during the rainy season.

These are overgrown with a coarse, rank grass. For miles around there is not a vestige of man, and the temporary buildings erected for our reception had the effect of frightening away all the game in the country—so unaccustomed were the deer and buffaloes who frequent the tank to any intrusion upon their solitude.

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* 1. Sigiri. 2. Kondrowawe. 3. Ruined Tank near Angoulasse. 4. Dimitelli. 5. Pollinarua, or Topari. 6. Giritelle. 7. Minnery. 8. Kowdella (bund destroyed.) 9. Kandelly, or Gantelawe. 10. Padiwel Colum.

The number and size of these artificial lakes sufficiently prove the sense entertained of the value of water as the first element of cultivation in a tropical climate by the former possessors of the soil in Ceylon, and the sacrifices to which a whole people submitted in order to secure this blessing, without which they were conscious that their labour must be of little avail. For no wisdom and no power in the ruler can have forced such efforts, even upon the most passive of oriental nations, without a general persuasion that the work was one of paramount necessity, and that all would participate in its benefits. Hence the veneration in which the names of Maha Sen and Prakrama Bahoo are still held, though causes unknown to us—wars, pestilence, or political revolutions—may have laid waste their capitals and driven the population from the neighbourhood of their mighty works into the mountains, where the Portuguese and the Dutch found them.

Can any use be made of these works by us?

The tanks themselves are perfect in all their essential parts. But where shall we find a population to replace that which has disappeared? For five consecutive days I rode through the most lovely country in the world, but in that country one thing was wanting—man!

To talk of tank repairs, or of laying out money in any other way than by bringing a fresh population into contact with the treasures which Nature has lavished upon the soil, would be uncalled for, as well as unprofitable.

Why repair Kowdelly or Padiwel Colum, supposing the attempt to be warranted by the state of the finances, when Kandelly and Minnery are pouring out streams of water that we cannot use for want of hands to till the soil?

We must therefore colonize or do nothing; and when I look to the low rate of wages in the northern province, denoting, as it does, a population much too numerous for the field of employment—when I recollect the annual emigration from the Seven Korles into Nuwera Kalawiya, for the purpose of obtaining ground on which to raise a crop of koorakan, which the dearth of water and the gradual decay of the smaller tanks prevent the people from doing at home—I cannot but think that the experiment might safely and prudently be tried.

I am of opinion that the plan proposed by Captain Sim should be fairly tested. It requires no large outlay. The co-operation of the Government Agent in the northern province would secure applications for land upon some arrangement similar to that suggested. Care must be taken to give a clear title to the land thus brought into cultivation, and to make the terms upon which it is to be occupied thoroughly understood.

There is a large Tamil population at Trincomalie which would facilitate the attempt; and, if a nucleus were once formed, the colony might receive additions from other quarters, and might in the end lead to some larger immigration scheme from the coast of India when people had become aware of the advantages with which successful industry would be attended.

Should a similar disposition be found in the Seven Korles, or in any other Singhalese district, a colony, with its headman, might be located in the neighbourhood of Minnery or Topari upon similar terms, taking care to keep the Singhalese and the Tamils apart.

The experiment is one in which the course to be taken must be determined by circumstances and time; but if the Legislative Council concur with me in thinking that it would be desirable to make the attempt, I invite it to authorise the expenditure of 1000*l.* for this purpose in the estimates for 1857, and I will pledge myself to spare no pains, so far as the Government is concerned, to bring the matter to a satisfactory issue.

2. *Report on the Canal from Ellehara, near Matelle, to Minnery, and thence to Gantalawa, near Trincomalie.*

OUR attention having, in 1853, been drawn to the remains of an enormous stone bund across the Ambanganga, at Ellehara, in the district of Matelle, we resolved on taking the first opportunity of making a close inspection of it, and of tracing the canal which, according to tradition, was directed from that river into the Gantalawe Tank, near Trincomalie. Circumstances prevented our carrying out our intention until lately, and, having now completed our exploration of this, the most extensive work of irrigation in Ceylon, we are induced to throw the information which we have collected into the form of a Report, for the information of Government, as it may at some future period prove useful.

It is recorded in the native histories of Ceylon that canals were formed, which conveyed the waters of the "Karaganga" to Minnery, and thence to Gantalawe; and these are attributed to king Mahasen, who reigned A.D. 275. Native history also records that Prakrama Bahoo I., who reigned A.D. 1153, diverted the waters of the same "Karaganga" into "the Sea of Prakrama." Local tradition assigns the canal at Ellehara to Mahasen, and the bund across the Ambanganga to Prakrama Bahoo; and Major Forbes, in his work on Ceylon, mentions having procured an inscription from a stone pillar, which, at the time he wrote, existed in the ruins of the bund, "signifying that the canal was completed by the happy, victorious, and illustrious monarch of Ceylon, Prakrama Bahoo." *

Now, as the Ambanganga is the only stream in that part of the country which bears the name of "Ganga," or which deserves to be described as a "river"—as the bund at Ellehara is the greatest work upon it, and as we have ascertained, beyond a doubt, that the canal leading from it conveyed its waters to Minnery, and thence to Gantalawe—these facts, supported by the unvarying tradition existing among the natives of almost every village along its route, seem to us satisfactorily to establish the identity of the "Karaganga" with the Ambanganga; and therefore to prove that the canals leading from it were the works of Mahasen, who, we are told, "formed the great Tank at Minnaria,† and by damming up the Karaganga, turned its stream into it," and "that he cut the Talawatta Ella Canal, by which means he formed 20,000 fields, which he dedicated to the Denenaka Wihare, whereby the rice grounds got the name of Dantalawe ‡ (Gantalawe—Kandaly§). But the inscription mentioned by Major Forbes, as well as local tradition, ascribe the bund to Prakrama Bahoo, whose reign commenced 852 years after the death of Mahasen. History also records, as we mentioned before, that among the many canals cut by him, "for the purpose of diverting the rivers into the great tanks," he formed "the Goodaaviree Canal, to divert the waters of the Karaganga into the Sea of Prakrama." ||

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* Forbes' Eleven Years in Ceylon, vol. ii., p. 95.

† Mahasen is still regarded as the Deity of Minnery: his shrine is there, and is regarded as the most sacred in Ceylon.

‡ දන් (an offering) තලාව (a plain.)

§ See 'Tournour's Epitome of the History of Ceylon,' published in the Ceylon Almanac for 1833. Also 'Mahawanse,' p. 237.

|| See 'Turnour's Epitome;' and his 'Notes,' published in the Ceylon Almanac, 1833, on Canals and Water-courses:—"The ambition and vanity of that sovereign

It seems therefore beyond dispute, that the "Sea of Prakrama" was in the neighbourhood of Ellehara, and the remains of the bund across the river, and the vast size of the embankment between that place and Kondrowawe, leave on our minds the conviction that it was formed by the enlargement of the works first executed by Mahasen.

We are led to this conclusion by a careful examination of the gigantic embankments, in parts 80 and 90 feet high, and by as careful a study of the adjacent country as our opportunities permitted. When the whole body of the river was diverted from its course, the waters, receding, must have spread themselves over many miles of flat or imperceptibly rising ground, to the foot of the Kondrowawe range of hills; and nine large streams being turned by the embankment, a series of immense lagoons, extending from Ellehara to Kondrowawe, must have been the consequence.

Reference to the drawing No. 2 will show that, in the first instance, the canal was excavated to a deep pool in the river, and that the bund built by Prakrama Bahoo, probably on the site of the former one by Mahasen, is at a considerable distance below the mouth of the canal, upon a ledge of rock stretching nearly across the river. It is probable, therefore, that Prakrama Bahoo took advantage of the existing works to assist him in carrying out his own project.

The situation of the "Sea of Prakrama" has never, hitherto, been satisfactorily ascertained. Major Forbes indeed surmised that the series of lakes formed by this canal might be "the waters to which the vanity of a king gave his own name;" but he adds "that until this canal shall have been traced through the Kondrowawe hills, the extent and difficulty of such an undertaking must excite doubts whether it were successfully accomplished." *

We have so traced it, and have, we think, proved that Major Forbes' surmises are correct. In no other parts of Ceylon are there the remains of so many, and so extensive, lagoons, so closely adjoining each other. In no part of the island is there, as far as we know, one continuous embankment, extending, without intermission, for 24 miles, and varying from 40 to 90 feet in height.

The "Sea" must have ceased at Kondrowawe, for, from the point where the communication branches off to Minnery and Giritella, the reduced proportions of the embankments, and the altered nature of the country, show that canals only extended to Minnery, Gantalawe, and Giritella.

We began on the 6th ultimo, by examining the commencement of the work at Ellehara, and taking the dimensions of the stone bund.

The Ambanganga is formed by the confluence, at or near the village of Ambene, of four or five considerable streams, taking their sources in the south and west parts of Matelle. Thence it is called the Ambanganga. A range of

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[Prakrama Bahoo] made him change their names, giving them the appellations of the great rivers of Dambadiva" [the Continent of India]. For example, the Goodaavairee Canal, from the river Godavery in India.

"At a late Meeting of the Society of Arts, Colonel Cotton, so well known as an advocate for the improvement of Public Works in India, contends, perhaps with a bias in favour of his own opinion, 'that our Indian possessions would be more benefited by Canals for irrigation and navigation, than by great trunk lines of railways. Without a proper supply of water the people are always liable to famines, and the marvellous fertility of the country remains undeveloped.' He 'proposes to improve rivers, to clear out the old canals which have become choked up by long neglect. The region watered by the Godavery alone would produce more cotton than we want.'"

* Forbes, p. 33, vol. ii. We had arrived at the conclusion that the series of lakes thus formed was the Sea of Prakrama, before seeing Major Forbes' remarks; and were surprised at the coincidence, when at Pollinarua we read the passage which we quote above.

hills, commencing from a spur of the Laggalle Mountains, extends in a northerly direction to the left or southern bank of the river, nearly opposite the present village of Ellehara. At a point where this range approaches within a distance of 200 yards from the river, a large embankment of earth, with stone revetments, commences, and extends for about 130 yards, terminating in a wing wall about 15 feet in height. Here begins the large spill-water, the length of which was probably about 90 yards, and from its extremity ran, at an obtuse angle, the great stone bund; this extended across the stream until it joined an immense earth embankment, with stone revetments, averaging 60 feet in height, which still exists, and leads to the mouth of Mahasen Canal.

The remains of the spill-water measure 76 yards in length. This brings us to the edge of the river, and it is evident that it was continued for some 12 or 14 yards further, to the rocky foundation in the bed of the river on which the great stone bund was built. The breadth at the top, at its southern end, is 29 yards, and at the northern end, where it has been carried away, 33. Its height above the level of the water at ordinary seasons is about 40 feet. It is built throughout of huge blocks of hewn stone embedded in chunam, which still remains in the interstices. The stones in the interior of the work were carved with figures, and evidently had formed part of a building of an earlier date. This is also observable at Kalawawe* and Balalawewe, works of irrigation in Nuwerakalawia, and also attributed to Prakrama Bahoo, which seems to prove that the larger works of irrigation in Ceylon are of a comparatively modern date.

Great engineering skill is shown in preparing the rock to receive the foundations of the large stone bund across the river. Upon the outer side these consist of a trench, cut into the solid rock, to receive the first layer of masonry: at a distance of 25 feet inwards is a continuous row of holes, 2 feet square, and about 3 feet apart, and sunk to a depth of about 3 feet; into these were fitted large stone pillars, the remains of some of which, broken short off, are still to be seen: one of them protrudes above the surface of the rock to the height of about 2 feet.

Parallel to this, and at a distance of 10 feet from it, is another row of smaller holes, into which also pillars were fitted to form the inner edge of the masonry. From the angle in the centre of the bund, another row of holes extends, in a semicircular direction, towards the spill-water.

The annexed drawings will better explain what we have thus attempted to describe.

From the northern extremity of the stone bund, and nearly in the same direction, a large earthen embankment, faced with stone revetments, extends as far as the mouth of Mahasen's Canal—a distance of nearly half a mile.

The waters of the river, checked by these vast embankments, must have inundated the low lands lying on either side of the river for a distance of about 10 miles, thus forming the largest of that series of lagoons which doubtless bore the name of the "Sea of Prakrama." As a proof that these low lands were so inundated, gigantic koobooks, trees only growing in or near the immediate neighbourhood of water, are now to be found far above the height to which the river overflows its banks.

At first sight it would appear, that here the river naturally divides into two channels, the one being very much larger than the other; but on closer inspection we have come to the conclusion, that what appears the smaller branch was, in reality, the mouth of Mahasen's Canal, leading into a deep pool in the bed of the river, which, with a bund very much smaller than that of which we have described the remains, would have afforded a sufficient supply of water for the purposes for which it is said to have been formed.

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* Dasenkelliya or Dhaatu Sena, probably formed this tank A.D. 459, but Prakrama Bahoo is said to have improved and repaired it.

Prakrama Bahoo, however, having conceived the idea of forming his " Sea,' constructed the bund we have described, at a point where he could obtain a good-rocky foundation, and could easily connect the high ground on either side of the river. We were led to the conclusion, that what now seems a smaller branch of the river is artificial, and was the excavated mouth of the canal, by the facts of its banks being rocky and precipitous, and very much higher than the land on the south side of the river. This channel, therefore, could not have been formed by the natural course of the water.

At a quarter of a mile from the mouth of the canal the rush of water appears to have breached the bank through which the stream now flows, and joins the river at some distance lower down. There are here some hewn stones scattered about, which are evidence of the remains of the embankment: from this point, therefore, the bed of the canal is quite dry; a very small stream only, in a slightly different direction, being led to the fields now existing at Ellehara.

From the same spur of the Lagalle Mountains, to which we made allusion before, a range of hills extend in a north-easterly direction through Kondrowawe to within half a mile of the Minnery Lake. The Ambanganga, having received the waters of several other streams, intersects these mountains at the village of Ambene, and flows down to Ellehara, a distance of about 14 miles.

To conduct the water of the Ambanganga to Minnery, and to divert the streams falling from this range of hills, this wonderful embankment, which extended, without intermission, for 24 miles, was constructed. Its height, as before mentioned, varies from 40 to 90 feet; but taking its average at 50 feet, it must have contained more than 3,800,000 cubic yards of earthwork, which, with the masonry, would have cost, at the present rate of labour, not less than 200,000*l*. This only includes the works from Ellehara to Kondrowawe. The range of hills to which we have alluded are at some places at a distance of several miles from the embankment, and the ground intervening between it and their base being flat, or rising with an almost imperceptible slope, was submerged. In other places the small spurs of the hills approached so near the embankment as to form a series of canals connecting the lagoons, which the receding hills enclosed. Of these lagoons the largest was that at the stone bund across the river, where the hills form a large amphitheatre; eight others, connected by as many canals, covered the intervening space above the embankment, between Ellehara and Kondrowawe.*

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* See Turnour's 'Notes,' Almanac for 1833, page 277:—"Before I make any extracts from that gentleman's interesting Report, I give the following literal translation from the Mahawanse, which contains an account of the principal canals in the reign of Prakrama, in the twelfth century, when they were brought to the highest state of perfection. The ambition and vanity of that sovereign made him change their names, giving them the appellations of the great rivers of Dambadiva, and calling the lake he formed after himself, 'The Sea of Pakrama.' 'The King [Prakrama] formed the deep canal called the Makara Ganga, which flowed from the Makara outlet of the Sea of Prakrama: from the same sea, the great canal Haima Wattee flowing to the Maha-Maigee-Wame. From the outlet called Samanmal, the canal distinguished by the name of Neela-Wapane: flowing from the outlet called the Keela-Kara Oodyaane, the Salalawatte Canal: flowing from the outlet celebrated under the name of Waitra-Watee, the Waitra-Watee Great Canal: from the southern outlet, the Toongha-badra Canal: flowing from the Mangala outlet, the Mangala Ganga Canal: flowing from the eastern outlet, the Champaa Canal: flowing from the same sea to the Poornawardhana Tank, the Saraswastee Canal: flowing westward of that (Saraswastee) canal, the Waimawattee Canal.'

"It is nowhere specifically stated in the historical records, that any of these

From the point at which the waters of the river have breached the canal, the embankment continues, about 50 feet high, to the present village of Ellehara. At a distance of about a quarter of a mile from the commencement, advantage has been taken of a flat rock to form a spill-water of about 70 feet wide, with wing walls 15 feet high. This was evidently as a safeguard for the overflow of water in the great lagoon, which, over this spill-water, returned to the river.

Mr. Turnour, in the Ceylon Almanac for 1833, quoting from Mr. Brooke's notes, mentions that "at the commencement of the canal, or about 300 yards from the Ambanganga, a basin has been cut, about 300 to 400 yards in circumference, said to have been excavated when the canal was made, and no doubt was originally a harbour for boats passing up and down." He adds, "it has also had a communication with the canal." We could find no trace of this basin, and think that Mr. Brooke must have mistaken the spill-water which we have described as the communication to which he alludes.

The present village of Ellehara is situated at about two miles from the mouth of the canal; the fields lie below the embankment, and are still cultivated by means of the water of the Ambanganga. Most of the houses, however, are now upon ground formerly part of the site of the great lagoon. A sluice through the embankment still conveys the water to the fields. The name of the village proves that its existence commenced subsequent to the formation of the canal.*

The few houses which yet remain occupied in this once extensive village are wretched to a degree; and from the number of ruined and deserted huts, and traces of sites of former dwellings, there is no doubt that the place was once very flourishing, even when Mr. Brooke passed through it, about 23 years ago. It contained 50 families, which number is now reduced to 10.†

On the 7th, leaving our camp at Ellehara, we set out to commence the exploration of the canal towards Kondrowawe. A road traced towards Batticaloa is cut for 3 miles, at no great distance from the embankment. Two considerable streams, the Kongatoo Oya, and Kirandegalle Ella, which were

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canals were navigable, but it is the general opinion of the natives, both of the learned and of those residing in the neighbourhood of these works, who have derived the information entirely from tradition, that the principal canals which received the names of rivers were navigable for canoes as far as Ellehara on the Ambanganga. The Sea of Prakrama with its many outlets as yet unknown or at least unnoticed, whenever it is discovered, will probably be found, like the bed of the Kalawawe tank, a forest in no respect differing from the rest of the wilderness in which it is situated."

The Survey annexed to this Report will shew, that one immense embankment, extending for upwards of 24 miles, forms a series of nine lagoons, connected with each other by nine canals. If Prakrama did change the names of existing canals (for if they had not existed in some degree how could he have changed their names, which, we have Mr. Turnour's authority for stating his ambition and vanity induced him to do?), this alone would account for the difficulty of identifying the "Sea," and seems to confirm the position which we have taken, that Prakrama Bahoo only enlarged and improved upon Mahasen's previous work.

Our inspection of the canal proves, that not only was it navigable for canoes, but for vessels of considerable burthen; and in all the villages through which we passed we found this tradition existing. The tamarind-tree alluded to at page 339 is a remarkable proof of its existence at Ellehara, and the people who pointed out to us the ruins of Mahasen's palace, near the Galoya, on the banks of the canal beyond Minnery, a distance of about 40 miles from Ellehara, described it as his halting place in his voyages up and down the canal.

* ඇළ a canal හරවනවා to turn.

† Mr. Brooke erroneously places Ellehara at a distance of only 9 miles from Nalande. Its distance, however, is about 19 miles.

once checked by the embankment, have breached it; the first about half a mile, and the second at about 2 miles from the village of Ellehara. At about a mile and a half from the last breach stands a gigantic Tamarind tree, on the top of the embankment. This tree, which measures 26 feet 2 inches in circumference, is called the Orubenda Siembalagaha.* Tradition has it, that boats stopping there on their transit up and down the canal, were fastened; and the natives point out some scars near its root, which they say were the marks of chains and ropes.† It is worthy of remark, that there is no other tree near it at all approaching it in size, and it is evidently a tree of very great age. We have found the traditions regarding the canal so consistent throughout, that we cannot help laying some stress on this legend, for we have the most satisfactory proof, from the size of the embankment, that the line from Kondrowawe to Ellehara was navigable. This tree stands at the end of the second large lagoon, and near it are the foundations of some building on the embankment, which was, at this point, about 90 feet high.

In consequence of the high lands approaching the embankment, a canal extends for a mile into the next lagoon, which begins at a spot where the Hirettia Oya enters it, and after flowing along the embankment for a short distance, breaches it, and flows down to the river. About half a mile further on, it is again breached by the Bakamoonoo Ella. From this point, half a mile of canal leads into another large lagoon, along the base of which the embankment extends for two miles, when the natural high land approaches, and forms, with it, a canal, which extends half a mile to the Kottapitiya Oya, which has breached the bank. The lateness of the evening here obliged us to return to Ellehara.

We now found considerable difficulty in obtaining any one who would undertake to guide us to Kondrowawe: for, though many had crossed the embankment at different places, no one had ever gone along it; and the distance and difficulties of the route were greatly exaggerated by the people, from their utter ignorance of it, and their fear that no water might be found by the way. The country between Ellehara and Kondrowawe is now an almost impenetrable jungle, nearly destitute of water, at this, the dry season, with only the site of a deserted village here and there.

Having at length succeeded in obtaining a hunter from Kondrowawe, who undertook to guide us, although he admitted that that part of the country was very imperfectly known to him, we dispatched our large tent, horses, and all the baggage we could spare, by the known road, which is a very circuitous one, to Kondrowawe, and on the morning of the 9th, taking with us only a small tent, supplies for two days, and as much water as we could procure gourds to contain, we started to prosecute our trace as long as daylight lasted. We quickly walked over the ground which we had chained the day before, and recommenced our survey from the Kottapitia Oya. While breakfasting, we imprudently sent on our guides and catty-men, with a view to expedite our work, and lost some time from having missed our way, the high banks of the Oya misleading us, as they closely resembled the embankment which was hidden from us by the thick jungle, but which, we afterwards found, left the river at a sharp angle. On regaining the embankment, we found that it gradually increased in size till it averaged, for many miles, 80 feet in height. For nearly three miles we found it without a breach, and it was evident, from the absence of jungle immediately above it, that in the wet season a considerable quantity of water collects along it. Here the lagoon must have been very extensive, as the base of the hills is four or five miles from the embankment.

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* ඔරුබැඳසියඹලාගහ "The tamarind tree to which boats are tied."

† If the wounds penetrated the bark of the tree, which they doubtless did, and reached the wood, Mr. Thwaites, the Superintendent of the Royal Botanical Gardens at Peradenia, informs us, that their marks would never be effaced; and that, were the bark over the wounds removed, it is very probable, notwithstanding the lapse of time since they were inflicted, that traces of the injury to the wood would be visible.

A little further on we found it breached, in two places, by a considerable stream, the Keerewanaheena Ella, which rises in the Kondrowawe range. For about three quarters of a mile, a canal connects this lagoon with the adjoining one. Evening was by this time closing in, and as we found that much of our supply of water had been drunk by the coolies to whom it had been intrusted, it became necessary to seek for camping ground at some reasonable distance from a spring. Our guide, who had hunted over this part of the canal, undertook to lead us to a plain about a mile from the Ella, at about 2 miles from which there was a spring. We then sent our coolies to pitch the tent and bring water, while we continued our survey as long as light permitted. We ceased chaining at a large rock spill-water, and it being too dark to take its dimensions then, we were guided to our halting place.

Early on the 10th we returned to the spill-water. We found it a sheet of smooth rock, about 12 feet in height, 110 feet long, and 110 in breadth. At one end of it is a channel cut through the solid rock, 7 feet deep, 6 feet wide, into which sluice gates evidently fitted, for the irrigation of the fields below. Wing walls rose at either end, about 20 feet above the level of the spill-water. Below the spill, and outside the large embankment, is another embankment, of considerable size, which apparently was for the purpose of protecting the fields, immediately below, in great floods, as well as for conveying the water to other parts of the country for the purpose of irrigation. We regret that we had not time to explore this branch, below which, we were informed, lies a vast plain, called Patambegaha Ella Damoonoo, where, doubtless, were formerly the fields irrigated by this sluice.

Opposite to the spill-water, and continuing parallel to the embankment for a considerable distance, we observed, at about 100 feet from it, a small earth bank about 6 feet high, which may either have been intended to regulate the flow of water over the spill, or to confine it in a canal, in the dry season, for the purpose of navigation.

At about 2 miles from the spill-water, the lagoon terminates in a canal, cut through rock, for a distance of about 200 yards, and about 30 feet in width; at the end of which the embankment is again breached by a stream, now called the Attanakade Ella. Two other breaches occur about a mile further on, caused by the Megolle Ella. One of them, probably, is at the spot where the sluice for the irrigation of the fields of the now deserted village of Oulpotegame existed.

The high ground here approaches the embankment, and a canal, for about three quarters of a mile, extends to the site of the deserted village of Talacolepitia, the fields of which were formerly irrigated by the water of Pécolom, a large tank situated about 4 miles west of the embankment. This village was deserted 25 years ago, and a few fields are still cultivated by the people of Kondrowawe, below the great embankment, by the water which escapes from the ruined tank in the rainy season, in a stream called the Radawigi Oya, which has breached the embankment just beyond Talacolepitiya.

We now approached the plains adjoining Kondrowawe, and owing to our guide's ignorance of the country, and the thickness of the jungle, again wandered from the embankment, which however, after some hours' search, we regained, about a mile and a half from the village of Kondrowawe, where we met our people whom we had sent by the road, and breakfasted. Here there is still a considerably larger tank about the embankment and at a higher level than the canal. This apparently was fed both by streams falling from the hills, and from the water of Pécolom tank. It is separated from the canal by a large embankment. Having ascertained that the spot at which the canal branched off to Minnery and Giritella was 2 miles further on, we proceeded thither, and there encamped for the night.

Between the village and this point, we passed two sluices, long disused, but originally for the purpose of irrigating the numerous fields once existing below the embankment. The first of these penetrated the embankment at a spot where advantage had been taken of a natural rock to form a spill-water, which is singular from the fact of its having two levels. The entire breadth, including both spills, from wing-wall to wing-wall, is 200 feet. The lower spill-water is about 8 feet from the present bed of the canal, and measures in breadth about 50 feet; the level of the higher spill-water is about 10 feet higher, and was 150 in breadth, and through it are two sluices, nearly at the level of the canal, each two feet square. The length was nearly 200 feet. Large waste plains are described as lying below this water, once, doubtless, rich paddy-fields; and the natives described an embankment similar to that which we had observed at the other spill-water. This, however, we had not time to explore.

The second sluice was so dilapidated that we could not distinguish its plan. There was evidently no spill-water here, and the natives could give us no information concerning it.

The direct line of canals and lagoons from Ellehara terminates beyond this sluice, in a stone spill-water, at a short distance above which branch off two canals, the one on the right leading to Giritella Tank, and that to the left said to lead to Minnery. The spill-water at the extremity of the canal consists of a solid mass of masonry, 112 feet in length, and 56 feet in breadth, and like the one which we noticed before is at two different elevations, the lower one having a breadth of 20 feet and the upper of 36 feet. The level of the one is about four feet above that of the other. The masonry of this spill-water is bonded together in a very peculiar manner, combining every possible mode of presenting resistance to the flood of water over it. The inner faces of the embankment here were protected from the action of the water by strong wing-walls.

The distance from the mouth of Mahasen's Canal to the spill-water is about 24 miles.

On the morning of the 11th we sent our tents and people direct to Minnery by the native path, and, having obtained a guide who undertook to bring us by the canal to that place, we proceeded with our survey, preferring the main branch to Minnery to the smaller one to Giritella. After chaining for one mile and a half we found that the direction of this canal bore considerably to the westward; and, after some hesitation, our guides confessed that they had never been there before, and that they now believed that this canal led to Pécolom instead of to Minnery, the only connection with the latter place being, they averred, by means of a sandy stream called the Talawatura, which conveyed the surplus of the great canal over the spill-water.*

As we had sent all our baggage to Minnery, and could form no idea of the distance to Pécolom, we were reluctantly obliged to abandon the exploration of this canal, resolving, however, to return on the first opportunity and satisfy ourselves as to its direction. We accordingly left the canal by one of its breaches, and following the Talawatura for a considerable distance, reached Minnery Lake through the old tank of Katukaliawe.

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* Vide 'Turnour's Epitome of the History of Ceylon.'

Mahasen, A.D. 275. Bud: 818.—"He also formed 16 other great tanks and cut the Talawattu Ella canal, by which means he formed 20,000 fields, which he dedicated to the Denanakka Wihare, whence the rice grounds got the name of Dantalawe (Gantalawe or Kandelly)."

We have now ascertained that a canal did exist from Kondrowawe, which conveyed the waters of the Ambanganga into Minnery, whence they were led to Gantalawe. The water which now escapes through the breaches of this canal, as well as that which falls over the spill-water at Kondrowawe, meet and form a stream which now falls into Minnery. This bears the unusual name of Tallawatura. Is it not fair to assume, that this name is but a corruption of Tallawattu Ella?

Fever, brought on by exposure, compelled us to halt here the whole of the following day, and on the 13th we proceeded, through Giritella, to visit the ruins at Pollinuara. Here we remained for three days, as we were all suffering more or less from fever, and on the 17th we returned, passing through the village of Minnery, and encamped between the outlets of Gantalawe and Kowdella canals. These outlets were for the escape of the surplus water of the Minnery Lake; the lower one, which is called the Mahawana, conveyed the water to the once enormous tank of Kowdella; the upper, or Agalawana, led the water to the Gantalawe or Kandelly tank.

We chose the latter, as it was the principal work, and on the morning of the 18th, under the guidance of an intelligent Weddah, we commenced tracing this canal, the course of which, except for the first three miles, has never before been explored. At the Weddah village of Rotewewa we found the people most primitive. They have been settled here from a very remote period, and said that once they owned all the adjoining lands. This village, and that of Potane, they told us, are presided over by a Weddah chief, who bears the title of the Rangdoon, or the "Golden Bow." Unfortunately for us, this chief was from home on a shooting expedition, and we had not an opportunity of making his acquaintance, but we saw his quiver, full of arrows, which he had left behind.

Leaving our tent and people here, we proceeded to inspect the great breach in the Kowdella tank, which we were informed was only two miles off; the distance, however, turned out to be at least six, the path lying through part of the bed of the tank, now a vast forest. The walk, fatiguing as it was, well repaid us, for nothing could have given us so good an idea of the immense size of the Kowdella tank as the view of this, the principal breach in it. The Gal Oya has breached the embankment of Kowdella, where the river had been dammed across, at a point where two natural hills approached its banks. These are not less than 90 feet above the present level of the water. The breadth of the breach cannot be less than 200 feet at the top; the bottom of the breach is now a large and deep pool of water, in which we saw several huge alligators. We had not time to go on to examine the stone bund, which has already been described by Mr. Bertolacci and Dr. Davy.*

We returned to Rotewewa for breakfast, and afterwards followed the canal for 3 miles further on, where the Gal Oya has breached it. At about a quarter of a mile up the river we found the ruins of a palace, said to have been built by Mahasen, which is now called Nana morella Maligawe, and encamped in a plain adjoining it.

Having now ascertained that the course of the canal from Minnery to Gantalawe lay at a higher level than the Kowdella Tank, and not through it, as supposed by Mr. Turnour,† and having found that the difficulties of proceeding along the bed of the canal were so great as to render it probable that cutting our way through the dense jungle would occupy more of our time than we could spare, we struck from this point on the morning of the 19th to the high road to Trincomalie, which we reached at Gal Oya rest-house.

We continued along the high road towards Gantalawe, and came again upon the canal, where it crosses the road near Kitoolouta, at the point noticed by Lieut. Atcheson.

That officer observes, "About 4 miles from the Tank of Dantalawa or Kandalla, the road crosses a canal from 20 to 30 feet broad, formed by an immense embankment thrown up on the lower side. This canal is said to be supplied by the waters of the Ambanganga, that river being dammed up and turned into this channel at Ellehara, feeding the tanks of Minnery and Kowdella in its course to Dantalawa." (See Ceylon Almanac for 1833, p. 281.)

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* See Ceylon Almanac for 1833, App. p. 275.

† See extract from Mr. Turnour in Mr. Brooke's Journal, p. 57.

The tradition of the origin of this canal was correctly given to Lieut. Atcheson, but he seems to have fallen into the same mistake as Mr. Turnour, in supposing that it passed through Kowdella tank in its way to Gantalawe.

We continued our journey to Kandelly, but found that there the tradition had become very faint and vague, in consequence of a Malabar population having superseded the Singhalese. The following morning we went to the tank, but as our time was too limited to admit of a lengthened search, and in the absence of native information to guide us, we could not ascertain, with any degree of certainty, the point at which the canal enters it. An old man, almost the only one who appeared to have ever heard of the canal, pointed out to us a sandy river, which, he said, he always understood was the point where the canal came in, and near it we thought we could trace the remains of an embankment.

We do not, however, regard our failure at this point as a matter of any importance, as the existence of a range of hills on the western side of the road, extending from the place at which the canal crosses it to the tank, renders it impossible that it could have led anywhere else than to Kandelly. We were informed by the villagers that an embankment exists leading from Gantalawe tank to Indiriweve, a tank a short distance from the north.

We now returned to Gal Oya, and determined to complete the link between Kondrowawe and Minnery, which we had lost by the misrepresentations of the people of the former place. We proceeded through Seegiri to Pécolom. To judge by its embankment, which is the largest we have seen, Pécolom must have been one of the most considerable tanks in this neighbourhood, inferior only to Minnery and Kowdella. The revetments were continued nearly to the top of its embankment, proving that its depth must have been very great. We ascertained that this tank was filled by the Kiri-Oya, a large stream almost deserving the name of a river, which rises in Nuweregalla Kandy, in the north-east part of Matelle, and is divided from the Ambanganga by the Kondrowawe hills. It flowed into Pécolom, and thence a part of its surplus water flowed through the Mada Horowe, or low-level sluice, where it has broken the bund, to Minnery; and the remainder escaped through the Goda Horowe, or high-level sluice, towards Kondrowawe, irrigating Meegahawelle, Talacolapitiya, and other tracts of lands, and eventually falling into the Ellehara canal. The Goda Horowe still exists, and the water collected by the ruined embankment in wet weather flows down in a large stream now called the Radawige Oya, which, as we before mentioned, breached the canal embankment near Talacolapitiya.

From Pécolom we proceeded to Kondrowawe, a distance of about 4 miles, and having brought with us guides in whom we could place greater reliance than in our former ones, we commenced on the 22nd to follow out the canal towards Minnery, which we had formerly been obliged to abandon. Having satisfied ourselves that the canal most probably did lead to Minnery, we started on the morning of the 23rd, having sent our horses by the path to the village of Ihekooloowadia, on the banks of that lake, and surveyed the canal into the village tank, which is separated from Minnery by its embankment only. The distance was 5 miles, and the canal was found to be much smaller and less perfect than any we had previously surveyed. The numerous breaches are to be attributed to the close proximity of the hills. The greater part of it is excavated, instead of being embanked. Not far from the point where the canal enters Ihekooloowewe we found a stone breakwater dividing the stream. We followed the larger and lower branch, having gone along the other one for a short distance and found it very indistinct and at a much higher level. We consider that this branch was simply for the escape of surplus water, lest the swollen stream of the canal should destroy the embankment of the tank, which is not far from the point at which it enters it.

We have thus satisfactorily ascertained that the water was conveyed from the Ambanganga near Ellehara to Kondrowawe, and thence into Minnery Lake; that another canal led the water of that lake above the level of Kowdella to Gantalawe,—thus verifying the native tradition, which we found consistent and unvarying throughout the whole line, until we reached the Malabar country, a distance of not less than 57 miles. Mr. Turnour, in his Notes on Canals and Watercourses, in the Ceylon Almanac for 1833, remarks, that " under the most favourable circumstances, their length is double, and in some instances four and five times the direct distance. Judging from these peculiarities, and giving a conjectural opinion, in each instance, of the nature of the country, a canal from Ellehara to Kandelly would exceed 100 miles." Our survey shows that Mr. Turnour over-estimated the length of the canal.

We have also ascertained that Kowdella was filled by another canal from Minnery. That a canal connected Kondrowawe with Giritella we have no moral doubt, although our time was too limited to enable us to explore it. We had it cleared for 6 miles, and rode along it nearly 2 miles, and the traditions at Kondrowawe and the neighbourhood of Giritella entirely coincide. It will be seen that there are still other canals connected with these, which we have not been able to explore; but we trust that the results of this expedition may afford a clue to the unravelling at some future time of the wonderful network of canals with which this part of the country was intersected.

" To have traced the line of the Ellahara canal through a mountainous country alone evinces the knowledge and great exertions of the natives of a former date." *

Had Mr. Brooke been in possession of the information which we have since obtained, the foregoing remarks would have told with tenfold force, for not merely did the projectors of this canal display profound engineering skill in completing the work, but they formed and carried into effect the still more wonderful conception of uniting a portion of the waters of the Kiri Oya, a river flowing on the opposite side of a high range of hills, with those of the Ambanganga at Kondrowawe, thence distributing them by minor canals throughout the country, and eventually reuniting the waters of the Kiri Oya in the Minnery Lake.

From our observations during the survey we think it probable that the face of the country was at that time comparatively free from jungle, and that, therefore, the difficulty of taking accurate levels was not then nearly so great as it would be at present. It seems, however, probable, from the growth of the forest in the bed of the canal, that many centuries have elapsed since it fell into disrepair.

In contemplating the grand conception of the projectors of these works, the economy of labour in availing themselves of the natural features of the country, and thus securing such great results by the construction of a single embankment; the wisdom displayed in diverting a large river from its profitless course, and thus diffusing wealth and prosperity through a previously barren waste; and the forethought in turning to account the drainage of the vast expanse of country through which the canal passes, cannot fail to excite wonder and admiration.

It is melancholy to regard the present altered condition of a country once brought by so much skill and labour to a state of perfect fertility. The Amban-

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* Brooke's Report, p. 61.

ganga now rolls on in its former unprofitable course. The streams, once checked and diverted into numberless tanks, flow through the breaches of the embankment, and are lost in the forest, and the whole country has become again a desolate and unhealthy jungle. Even at this, the most healthy season of the year, out of about 40 people who accompanied us only seven have escaped fever and dysentery.

The population of the few remaining villages is annually decreasing. Between Ellehara and Kondrowawe we passed near five villages recently deserted, and many places were pointed out to us as the sites of villages abandoned within the last century. Some idea may be formed of the depopulated state of the country by the fact, that, in a distance of 24 miles, there is not one inhabited village, although we passed some fields which are still occasionally cultivated by the people of either Ellehara or Kondrowawe.

The excellent state of repair in which we found the embankment from Ellehara to Kondrowawe, suggests to us the feasibility of restoring these works to their former state; but we do not think that any benefit would arise from the repair of the canal from Kondrowawe to Minnery, as the waste water would naturally fall over the spill-water into the Talawatura, and so into that lake, and the canal which we traced can only have been formed in order to complete the line of navigation.

We are not in a position to speak with any degree of certainty as to the practicability or otherwise of repairing the line from Minnery to Gantalawe.

To revert to the first part of the work. The dam across the Ambanganga could easily be rebuilt; and the repair of the fourteen important breaches which occur in the entire line of embankment present no serious engineering difficulties. A natural bed of rock having in every instance been selected for the spill-waters, their restoration would be comparatively easy. To effect these repairs a large force of men would be necessary, as operations could only be carried on for about three and a half months in each year, owing to the floods during the rainy season. A great obstacle, too, would be found in the difficulty of obtaining a sufficient supply of water for the workmen.

It would be useless, however, to attempt these repairs unless Government were prepared to import population on an extensive scale, for the cultivation of the lands which would be made available by the vast supply of water which would then be at command. But this does not seem an insuperable obstacle when we take into consideration the over-populated state of parts of the south of India, which is such, that in one of the 20 provinces of the Madras Presidency alone, a few years back, no less than 200,000 people died from famine in one year; and we believe we are correct in stating that last year the Government was compelled to support 100,000 people to prevent them from meeting the same fate.

Before entertaining the idea of repairing these works a trigonometrical survey of that part of the island would be indispensable, in order to ascertain what the effect of the accumulation of so large a body of water would be upon the adjacent country; and for this great natural facilities exist in consequence of the numerous isolated hills with which the neighbourhood is studded. We have ascended several of these isolated points, and examined the country with a view of ascertaining the feasibility of a thoroughly organized system of triangulation.*

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* If the repairs were effected, a large body of water would flow over the Kondrowawe spill-water into Minnery; this would find its outlet by the low-level escape channel or Mahawana, and flow into Kowdella. Thence we think the water would escape by the large breach into the Kowdelle Aar, which is said to join the Mahawellaganga near the point at which the Virgil Aar strikes off. There is no doubt that this stream enters the Mahawellaganga, and should it prove that

We originally planned this expedition for our own satisfaction, but finding that its results have so greatly exceeded our expectations, we have resolved to communicate them to Government, hoping that they may prove not devoid of interest.

ALEX. YOUNG ADAMS.
JOHN F. CHURCHILL, C.E.
Sept. 19, 1855. J. BAILEY.

3. *Report on the Kandelly Tank*, by CAPTAIN SIM, R.E.

SIR, Royal Engineer's Office, Kandy, 22nd April, 1856.

I HAVE the honour to acquaint you, that on the 20th June, 1855, I addressed a Report to his Excellency the Governor concerning the Kandelly Tank, and its probable capabilities for the purposes of irrigation. That Report was necessarily conjectural, as I was not in a position to obtain precise information, but having, in February last, had the honour of accompanying his Excellency to the spot, and since received his instructions to make a detailed investigation of the subject, I beg now to lay before you the opinion I have been enabled to form.

As, according to our regulations, it will be requisite for you to transmit a copy of this letter to Sir J. Burgoyne, the Inspector-General of Fortifications, I trust I shall be excused if I advert more fully to the general question of the tanks, than I should have done, had I to address the Colonial Government alone.

Throughout the northern and eastern provinces of Ceylon are to be found very many of these tanks, or artificial reservoirs of water, formed by the construction of a dam or bund across the gorge of a valley, and fed by the drainage of the surrounding districts. Some, such as Minnery and Kandelly, are beautiful sheets of water, at times from 15 to 20 square miles each in area; others contain but little water; while the majority, broken through at the bund, and thoroughly drained, appear as plains of grass in the midst of the forest.

The value of water so stored up, in a tropical country, is incalculable. That the ancient inhabitants of the island were aware of this, it is only necessary to contemplate the remains of the great works they executed for the purpose. Without a supply of water at the proper season the crop of paddy or rice fails, and famine ensues, followed by the utter abandonment of villages and districts. With the tanks in order, prosperity and no slight degree of civilization prevailed among the Singhalese; but with the means of irrigation and agriculture neglected, the country has become desolate and unhealthy, while the natives have gradually fallen into their present state of helplessness and degeneration.

In my letter of June I alluded to the flourishing state of Tanjore, and the vast sum of half a million paid by Ceylon annually for grain, principally to that country. With an expenditure on works of irrigation of 4000*l.* per annum for 50 years, that district has so prospered that the population has doubled, and the revenue risen from 300,000*l.* to 500,000*l.*, while the saleable value of the land is now equal to four millions. Had half the money spent on such works in Tanjore been spent in Ceylon instead, in keeping in repair those already existing here, this island would probably have exported, over and

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its junction is below the point at which the Virgil Aar strikes off, the addition of this large body of water to the stream might result in opening the navigation of the Mahawellaganga; an object which, in 1832, occupied the attention of Government. (Vide Brooke's Journal, p. 29.)

above its own wants, as much grain as it now depends on other countries to supply.

However fully recognised may be the importance of the tanks, it is not within reason to expect, that the Government could at once plunge into any costly scheme for their restoration. Yet, to overlook them altogether—to cast aside all consideration of those that even now might be turned to profitable account—would be equally injudicious. An experiment on a small and inexpensive scale might surely first be tried before the subject is entirely rejected—if successful, it could be repeated; if a failure, but little would be risked.

Of all the tanks, Kandelly offers the most advantages for such an experiment. Presenting to view an area of about 15 square miles in the rainy season, and never less than three in the dryest, it is enclosed by hills of moderate elevation, covered with forest—a slope of grass extending from the border of trees to the edge of the water.

The artificial bund by which it is retained is a mile and a quarter in length, about 50 feet in height, with a base of from 150 to 200 feet. Its inner side is faced the whole way with loose boulders, to protect the embankment from the action of the water. Two stone sluices or aqueducts, at different sites and levels, each with two watercourses, separated from one another by a stone partition, are constructed underneath the bund; and the streams they supply, uniting at a short distance, flow for 12 miles into Tamblegam Bay, which is close to the harbour of Trincomalie. The high road to that port from Kandy runs by Kandelly, rendering the tank easily accessible; by Tamblegam Bay it is 21 miles, by the high road 25, from Trincomalie. With the exception of the sluices the bund may be pronounced in a perfect state. The immense stones that formed the upper sluice have fallen in, nevertheless the water percolates through them, and affords an ample stream for the greater part of the year, but in the dry season it sinks below the level of the outlet.

The lower sluice is about 12 feet below the surface of the water when the upper one ceases to run. It has never been uncovered, and, on the whole, may be said to be in order, excepting that part of the water escapes out of the side close to the lower end of the watercourse. The stream is always full, however, and the sluice no doubt will perform its part for many years to come.

There are two other sources of contribution to the main Tamblegam stream or river; one proceeding from the small tank of Winderasen, 2 miles to the north of Kandelly, and about 3 square miles in extent, which affords, for more than half the year, no inconsiderable supply, and the other from the spill-water or waste weir of Kandelly, whenever the water rises excessively in the height of the rainy season.

But the reason, above all, why Kandelly offers greater advantages than any other tank is, that, whereas population is wanting in the vicinity of almost all, large paddy-fields, worked by a considerable number of natives, are to be found on the banks of the Tamblegam river. The only experiment therefore needed is the improvement and extension of what now exists as a nucleus.

There are two settlements at present earning their maintenance by the help of the water of the tank: Kandelly village is close to the bank, and Tamblegam village is situated on the bay of that name. The former is but 25 ammunams, or 50 acres in extent, with about 30 families, and is almost wholly private property. The latter is 2500 ammunams, or 5000 acres, all cleared and ready for planting, with a rich soil returning fifteen-fold; and the population is between 300 and 400 families. More than one-tenth of the area is scarcely ever under cultivation at the same time. Yet with these fine fields close at hand, Trincomalie has been known to be half starved at times, for want of rice. On one occasion, within the last two years, when there was a great deficiency in the town, the authorities proceeded, out of necessity, to seize by force all the grain to be found in the neighbouring villages; giving, however, ample remuneration to the owners.

The point to which I would beg particular attention is, that out of these 2500 ammunams, 1000 are declared by the Wannia to be the property of the Crown. At one time or another they have all been cultivated, though now they are rarely touched. If offered for sale, I am assured the land would not fetch 15*s.* per acre, even if purchasers could be found to invest, the population being too scanty for an increase of cultivation. But I am persuaded, that if the Government would undertake to divide the area into allotments of two ammunams each, which is about the extent that one man and his family will be able to work, allow them to be held for the three succeeding years after the first (which should be rent free) on the small tax of a tithe of the produce, and at the expiration of that period sell them on regular titles, with the right of preemption to the then occupants, no difficulty will be experienced in obtaining the necessary amount of population. Should it, however, be found that the people of these parts, reduced as they are to the extreme of poverty, are not in a position to avail themselves of such an offer on the part of Government, being without the means of purchasing buffaloes, or implements of husbandry, or of providing themselves with food during the first year of occupation, I would respectfully suggest the proposition, that advances of 1350*l.*, confined to 100 men or families, might be made for these purposes, to be repaid to Government in four years, in the manner detailed in Appendix.

If this scheme were to answer, a second batch of 100 might be, in like manner, accommodated, till the whole 1000 ammunams, sustaining 500 families, were under cultivation.

No outlay beyond the advances would be required, for the bund and sluices of the tank need no repair. Sufficient water flows at present from them for the irrigation of 1250 ammunams, allowing, according to Col. Cotton's estimate, 7500 cubic yards for the irrigation of each acre, and taking the tank at its smallest extent, of about three square miles, with an average available depth of six feet.

The only requirement is, the clearing of the jungle over the sluices, and this should be done forthwith, whatever the future intentions of Government may be with regard to Kandelly. Nothing but the gradual expansion of the roots of the trees, aided by the force of running water, could have availed to displace the huge stones of the sluice. Those which capped the lower ends of the watercourses are, from their dimensions, nearly six tons each in weight; one is split, and the other thrown down.

Looking beyond the time when these Crown fields may be brought into cultivation, in the manner described, there is no reason why nearly the whole of the land bordering on the Tamblegam river should not ultimately be laid out, sold, and turned to similar account; to the extent of half a mile on each side, and for the whole distance from the tank to Tamblegam, constituting an area of between 3000 and 4000 ammunams. In the event, however, of Government considering it worth while, at any future period, to carry this idea into practice, it will be essential to husband the supply of water in the tank, and regulate its discharge. Since more than treble the quantity would then be required, none should be permitted, as now, to run to waste in the wet season. But, for this purpose, new sluices would be necessary. The old sluices are defective, and to repair them would be expensive and troublesome in the extreme. The very removal or shifting of the enormous stones would be, of itself, a work of the severest labour, and considerable time. I should, therefore be disposed to recommend the adoption of new sites for the sluices, allowing, till their completion, those now in operation to perform what service they could. The coffer-dams would involve less trouble in their construction, and instead of stone watercourses, it would be preferable to substitute large cast iron pipes, of about three feet diameter. Such might be laid without difficulty, and the trees would not injure them. They should be furnished with sluice doors at each end, and a competent person should be appointed to have them charge.

I cannot conclude this letter without stating, that I was accompanied at Kandelly and Tamblegam by Mr. Birch, without whose intelligent aid, and knowledge of the country and language, I should have been at a loss to pursue any inquiry into the subject of this Report.

XVII.—*Explorations into the Interior of Africa.* By Dr. DAVID LIVINGSTONE,* M.D., LL.D., F.R.G.S., etc. (*Gold Medallist.*)

(Continued from Vol. XXVI.)

(Addressed to Sir R. I. MURCHISON, Pres. R.G.S.)

Read, December 15, 1856.

1. *From Cabango to Linyanti; with a Dissertation on the Structure of the Southern Part of the African Continent. Forwarded from Teté on March* 3, 1856.

Linyanti, on the River Chobe,
Oct. 16, 1855.

SIR,—By a note dated Cabango, in August last, I endeavoured to convey an idea of the country between Cassangé and that point, and, if the rough tracing enclosed reached its destination, you will have remarked that there was little absolutely new to communicate. The path followed is that usually trodden by native Portuguese, who are employed by the Angolese merchants to trade with Matiamvo—the "Muata-ya-nvo" of some—the paramount chief of the negro tribes called Londa (Lunda) or Balonda. There is another and straighter course situated a little farther north, and I suppose it is there the scarcity of water mentioned by others is experienced. We never found it necessary to carry a supply, and almost always spent the night at villages situated on streams or rivulets. A Portuguese merchant and planter, Senhor Graça, of Monte Allegre, whose açquaintance I had the pleasure of making, was once a visitor of Matiamvo; and his notes, having been published in the Government Gazette or "Boletim" of Loanda, might, I conceive, still be found in Lisbon.† A severe and long-continued attack of fever, soon after crossing the Quango, made me so very feeble and deaf, that I was glad to avail myself of the company and friendly aid of three native Portuguese, whose employer, Senhor Neves of Cassangé, very politely enjoined them by

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* Dr. Livingstone formerly wrote "Livingston," without the *e*.—ED.

† *See* R. G. S. Journal, vol. xxvi., pp. 123, 128.—ED.